IDAHO GLOBAL ENTREPRENEURIAL MISSION

# 2014 ANNUAL REPORT

The Idaho Global Entrepreneurial Mission provides a three pronged investment in Idaho's economic and technological future. This unique program strategically builds a statewide environment to bring forth advances in agribusiness, computer science, medical and veterinary research, environmental preservation – among many other fields vital to the state's economy. IGEM has yielded successful results in its first two years of operation, with quality research projects that are positioning Idaho industry in new and profitable markets and propelling innovation within the state.

IGEM - Idaho Department of Commerce (IGEM-Commerce), IGEM - State Board of Education Higher Education Research Council (IGEM-HERC), and IGEM - Center for Advanced Energy Studies (IGEM-CAES) have assembled thoughtful strategies for accomplishing the broader goals of IGEM by supporting the creative epicenters of Idaho: The University of Idaho, Idaho State University, and Boise State University. This annual report provides a succinct update on IGEM projects and highlights their advancements.

## IGEM PROVIDES THREE DISTINCT FUNDING OPPORTUNITIES:

### IGEM – COMMERCE
### $1 MILLION

Managed by the Idaho Department of Commerce under the direction of the IGEM Council.

Research grants between university and industry partnerships geared toward commercialization initiatives.

### IGEM – HERC
### $2 MILLION

Managed by the State Board of Education (SBOE) and administered by the SBOE Higher Education Research Council.

Higher Education infrastructure grants distributed to each university to fund key capability development initiatives.

### IGEM – CAES
### $2 MILLION

Managed by the State Board of Education (SBOE) and administered by the SBOE Center for Advanced Energy Studies.

Research grants supporting developments in Advanced Energy initiatives.

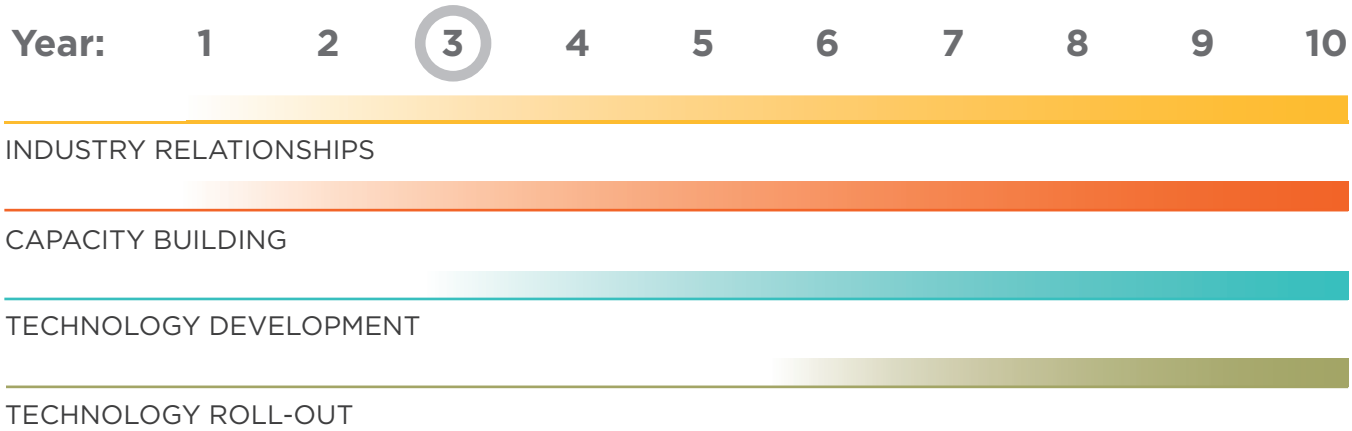
IGEM

IGEM-Commerce is an important part in advancing technology and the economy throughout our State. The IGEM-Commerce program focuses its funding at projects progressing toward commercialization. Together, Idaho industry partners with Idaho's three research universities in bringing new ideas, concepts, and future products to the world market.

At the helm of the IGEM-Commerce program is the IGEM Council, an appointed 12 member body whose diverse experiential make up consists of the brightest business, research, policy, strategic, and financial minds in the state. This 12 member Council thoroughly vets IGEM grant proposals to mitigate risk and maximize the return on investment for these publicly funded grants. The IGEM Council's fiscal stewardship and strategic direction, advances IGEM's overall intended goal of cutting edge expansion throughout the state, leading to high end job creation, and a more progressive economy.

The chart below provides a broad overview of the IGEM program spectrum. It begins with building strong relations with Idaho industries and seeking opportunities where IGEM funded commercialized research is beneficial both for the industry partner and the University. It identifies the need to build capacity and internal infrastructure in order to advance specific technology industries forward, such as AgriTech, AeroTech, MedTech, VetTech, EdTech and many others.

IGEM Commerce is beginning its 3rd year. The following pages provide an update on past and current projects.




NPM Lab

# FY2014 IGEM-COMMERCE COMMERCIALIZATION GRANT AWARDS

## CANINE HIP IMPLANT

An innovative hip implant for canines is being developed by an Idaho-based partnership between veterinary surgeons (WestVet), scientists (Boise State University), and engineers and distributors (MWI). The business opportunity is to develop an economical and less invasive medical device to treat hip osteoarthritis in canines. Hip osteoarthritis occurs from the wear and tear of the protective cartilage that covers bone surfaces. The disease is irreversible and life altering, and for some canine breeds the lifetime risk to develop hip osteoarthritis is 50%. A new implant, the Bionic Hip System™, has been developed by MWI to improve the standard of care for treating hip osteoarthritis by reducing cost, improving canine mobility and lowering complications. In this project, Boise State is characterizing the mechanical performance of the implant, prior to a clinical trial at WestVet.

## RISE ANALYTICS

Idaho State University has partnered with ON Semiconductor for analytical research in the development and improvement of semiconductor products. The acquisition of Scanning Electron Microscopy and Energy Dispersive Spectroscopy (SEM/EDAX) equipment has the potential to help all Idaho semiconductor companies in the development of products in their pipeline.

## 2E-HEXENAL

At the University of Idaho, researchers are testing an organic compound called 2E-hexenal as a fungicide for stored potatoes. The use of this potential fungicide in a gaseous form would deliver great value to the state of Idaho's "famous" product: the potato. This new approach to eradicate fungi would be industry changing. U of I has partnered with Sun Rain LLC and Agri-Stor Inc. to study the effectiveness of this fungicide in post-harvest tubers.

## SURFACTANT SOLUTIONS

Boise State University and its partner, BHS Solutions, are investigating the potential to separate surfactant properties from potato processing oil and transform these properties into elements that can be used in household items like laundry detergent, dishwasher detergent, among other products. This could provide a high yield by-product from potato processing oils.

# AWARD UPDATES

**To date, IGEM Commerce has funded 11 total projects; Four in 2014 and seven in 2013. The following provides a succinct update on their individual progress and results.**

## NANOFABRICATION INFRASTRUCTURE SUPPORT

**Idaho State University - Project has been completed.**

**Grant Amount: $250,000**

**Results =** The project allowed for the acquisition of a Dualbeam Nanomachining Center. The Dualbeam system provides both high resolution imaging and nano-machining capabilities in a single component. This tool enables the University to provide ultra-precise machining and nanofabrication capabilities that meet the needs of their semiconductor industry partners. This project has supported collaboration with the University of Maryland. The accessibility to this machinery provides ISU students with hands-on cutting edge training, uniquely preparing them as they enter the workforce. To date, ISU has received over $3.5 million in separate funding, resulting from this IGEM sponsored project.

## HIGH SPEED DIGITAL PACKAGE MEASUREMENT & MODELING FOR NEXT GENERATION MEMORY MODULES

**University of Idaho - Project has been completed.**

**Grant Amount: $150,000**

**Results =** The project allowed for speedier development and design on next generation memory modules with the acquisition of the Vector Network Analyzer. Micron, an Idaho based industry leader, found simulations conducted as a result of this project vital to their business. The acquisition of the Vector Network Analyzer, not only helped Micron but it also prepares U of I students with hands-on education on the latest industry equipment. This real life training propels U of I graduates entering the workforce. Additionally, the Micron Foundation gifted $1 million to U of I to fund an endowed professorship in microelectronics in the College of Engineering. This gift will support U of I's efforts to better position itself as a leader in microelectronics education and research.

## INNOVATIVE PESTICIDE APPLICATION TECHNOLOGY SYSTEM

**University of Idaho - Project has been completed.**

**Grant Amount: $46,146**

**Results =** The project allowed for field tests to be conducted to quantify the effectiveness of the new pesticide spraying technology compared to conventional spraying. Field tests found that the new spraying technology performed better than existing technology. This project has raised $2 million in capital for the industry partner, who also hired 6 new employees.

## AUTOMATED QUANTITATIVE DETECTION OF E. COLI O157:H7 AT BEEF PROCESSING FACILITIES

**University of Idaho - Project has been completed.**

**Grant Amount: $78,076**

**Results =** The project examined if there was a better process to detect and determine the strains of E. Coli within the beef processing system. The new method combined quantitative polymerase chain reaction (PCR)

to rapidly screen for O157 and confirmatory bacterial colony growth using unique recognition software. Six strands of E. Coli were identified as they came into the process. The confirmatory process, normally taking 24 hours to sample cattle was reduced to two hours with the new process.

## COMMERCIALIZATION OF NEW AQUATIC ANIMAL HEALTH PRODUCTS

**University of Idaho - Project has been completed.**

**Grant Amount: $124,021**

**Results =** The project allowed for trials on a new fish vaccine and a probiotic feed additive aimed at reducing fish losses in aquaculture facilities due to Cold Water Disease (CWD). The iron limited vaccine yielded successful results. This formula work will be used for final regulatory approval with the FDA. The University and its pharma partner are on track to commercialize these viable products.

## DETERMINE COMMERCIAL VIABILITY OF MICROBIAL INDUCED CALCITE PRECIPITATION (MICP)

**University of Idaho - Project has been completed.**

**Grant Amount: $114,864**

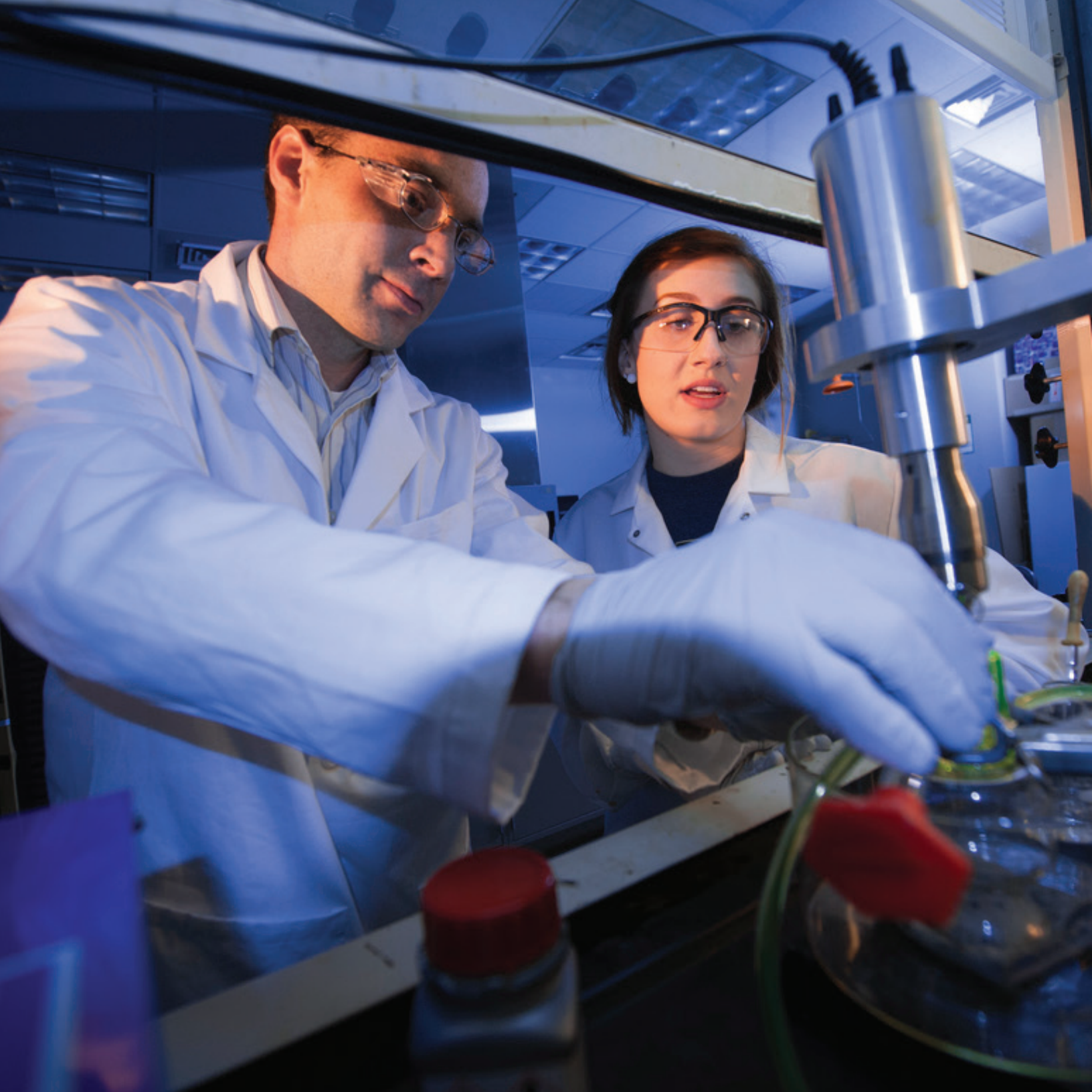
**Results =** The project allowed an assessment to be made on the viability of MICP, a process that uses microorganisms already present in the soil to form calcite. Applications to control soil erosion have been successful to date. Further observation is needed to assess control and performance in more severe weather conditions. Assessment found a substantial increase in the weight that the product would support. A new Idaho company "BioCement Technologies, Inc." has been created as a result of this new product. In addition to receiving IGEM grant funds, this project also received National Institutes of Health (NIH) Small Business Investment Research (SBIR) funding in September 2014. The SBIR Phase I grant was $53,968 for a 6 month study and they have applied for a Phase II grant for up to $1 million for two years, further substantiating the marketability and potential of this new product.

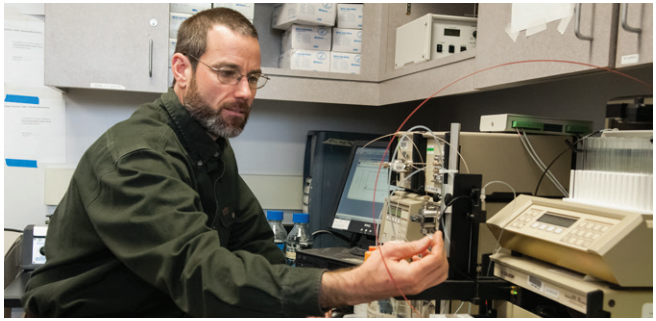
## CONDUCT PRECLINICAL STUDIES ON POTENTIAL ANTICANCER AGENTS

**Boise State University - Project is on schedule to be completed June 2015.**

**Grant Amount: $80,986**

**Results to date =** The project focuses on the analogs of doxorubicin and mitomycin C, two compounds that have an important role in the treatment of a variety of cancer types. Use of these analogs has declined due to side effects, including myelosuppression and the onset of irreversible acute cardiotoxicity. Research efforts to gain knowledge on doxorubicin and mitomycin C's mechanism of toxicity have provided tangible results. Initial studies (in vitro) have shown that Aclacinomycin A (Acm) analogs in both classes were 170% more effective. Anticyclines analogs (ACA) were 35,000% more effective. They have also proven effective against sarcomas. BSU anticipates presenting its Idaho pharmaceutical partner with the analogs in order to conduct further testing.





# IGEM - HERC

## IGEM – HIGHER EDUCATION RESEARCH COUNCIL (HERC)

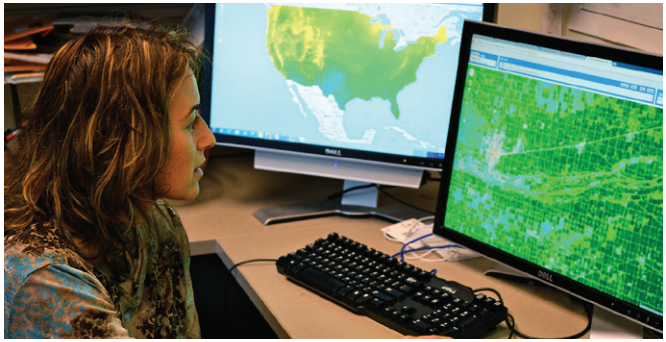
The public higher education research institutions are in the third year of the initial round of IGEM grants under the direction of the Higher Education Research Council (HERC). The IGEM funds are used to support research and development of expertise, products, and services which result in state economic growth. Priority is granted to those proposals that can show a strong collaborative effort among institutions as well as the private sector or exhibit high potential for near term technology transfer to the private sector.

The institutions report to HERC each year on the status of their projects including progress toward key objectives, budget expenditures, economic impact and commercialization potential. The initial awards granted in fiscal year 2013 were for a three year term contingent on each project meeting approved performance measures. Additional funding after fiscal year 2015 will be based on a competitive process under the direction of HERC.

The process incorporates an independent peer review of proposals and an evaluation component for identifying the project success and economic benefit to the State. Performance measures established for project accountability are specific to each award and are objective, measurable and realistic.

**University of Idaho – Multidisciplinary Cyber-Security Faculty Cluster Hire ($674,900)**

The focus of the University of Idaho project is on the creation of a multidisciplinary cyber-security faculty cluster that will have the capabilities of expanding cyber-security research and education in computer science, electrical and computer engineering, civil engineering and sociology. This is being accomplished through the recruitment of five new faculty, engineering and information technology support and the establishment of a specialized software security testing laboratory.



This faculty cluster is pursuing new external funding opportunities for on-campus research and also pursuing collaboration with Idaho and regional industry. The University has received a $444,000 grant from the federal government (for calendar year 2014) for cybersecurity research related to industrial technologies.

IGEM funding helps support technology and knowledge transfer activities such as workshops and seminars. In 2014, the University began a seminar series on cybersecurity consisting of a collection of academic research talks, industry presentations and how-to tutorials. In addition, U of I hosted a Cyber Security Symposium last spring, which provided an opportunity for academic researchers and software and system developers from industry and government to meet and discuss state of the art processes related to cyber security, which will include practice research and technologies.

**Idaho State University – Development of commercially-viable, accelerator produced materials for medical and semiconductor industry applications ($515,600)**

The goals of this project include developing proprietary and patentable intellectual property that improves the production and lowers the cost of the isotope Cu-67 and also establishes infrastructure for additional isotope production and materials. Cu-67 is a “manufactured” radioactive isotope of copper that could be significantly better for Radio-Immuno-Therapy (RIT) and Diagnostics.

ISU made significant progress in fiscal year 2014 in development of an economical process for production. They completed multiple automation and safety improvements, dramatically improved the process, and completed sample runs. This resulted in achieving Nuclear Regulatory Commission (NRC) production and distribution licensing. In addition, ISU now has two patent applications pending for Cu-67. Sample shipments are expected in fiscal year 2015, and the project is operating on time and at budget.

ISU continues to receive support for this project from private sector partners and secured several additional grants last year for capital costs and additional research and development. With IGEM and other funding, researchers have built specialized equipment for isotope production and handling, proprietary vacuum furnaces for separating materials and other one-of-a-kind equipment. This has, in turn, lead to contracts with private companies to use the specialized equipment for development related to isotope production.

**Boise State University – Computer Science Department Expansion and Restructuring ($700,000)**

BSU's project is designed to meet compelling state economic development, research, and workforce needs. Progress toward meeting this objective includes recruiting and retaining faculty and staff. Last year, the Computer Science Department (CS) was successful in hiring four new faculty members to increase computer science research and bring expertise to help prepare students for careers in software engineering, big data, databases and visualization and focusing on student retention and completion.

In 2014, the project focused on more integration with industry through faculty and student interactions. Representatives from local industry are now teaching CS courses, with a Senior Seminar class and a Senior Design Course having been added. The design course provided students with the opportunity to work on industry sponsored software engineering projects that are now at various stages along the path to production at respective companies. Approximately 80 percent of CS undergraduate students serve an internship with a local company before they graduate.

The project received $3.4 million of grant funding in 2014 including a grant of $555,384 from the National Science Foundation to purchase a GPU supercomputer with a visualization facility and a $1 million grant from the Idaho Department of Labor with matching funds from local software companies to build teaching capacity for undergraduate students. Since receiving the initial grant award BSU has seen an increase in student retention and rates and expects the number of bachelors in Computer Science to continue to increase significantly over the next two years. To improve retention of student, the CS Department has restructured its core sequence of courses and is developing a tutoring center. The IGEM funds have also supported graduate students in their research efforts.

# IGEM - CAES

**The Center for Advanced Energy Studies is a research and education partnership between Boise State University, Idaho National Laboratory, Idaho State University, University of Idaho, and now, University of Wyoming.**

## CAES CONSORTIUM MEMBERS WIN OVER $3.7M IN DOE NEUP & NEET AWARDS FOR NUCLEAR ENERGY R&D

In August, BSU, ISU, and the INL won $3.7M of the $67M worth of the Dept. of Energy's Nuclear Energy University Programs (NEUP) and its Nuclear Energy Enabling Technologies (NEET) grant awards to support nuclear energy research and development (R&D) projects, technology infrastructure improvements, and R & D capabilities.

### 2014 NEET R&D Awards:

**$1,000,000 – INL** - Enhanced Micro-Pocket Fission Detector (MPFD) for High Temperature Reactors
**$980,804 – BSU** - Nanostructured Bulk Thermoelectric Generator for Efficient Power Harvesting for Self-powered Sensor Networks

### 2014 NEET Infrastructure Awards:

**$635,910 – INL** - Three-Dimensional Computed Tomography for Advanced Instrumentation Imaging
**$592,783 – INL** - Nuclear Fuels and Materials Characterization Enhancement at Idaho National Laboratory (Equipment for MaCS lab)

### 2014 NEUP R&D Awards:

**$400,000 – ISU** - Experimental Breeder Reactor II Benchmark Evaluation

### 2014 NEUP Infrastructure Awards:

**$91,741 – ISU** - Idaho State University Reactor Laboratory Instrumentation and Physical Facility

## WYOMING COWBOYS JOIN IDAHO UNIVERSITIES

In October 2014, the University of Wyoming (UW) joined the CAES consortium, becoming the fifth member institution along with founding consortium members Boise State University, Idaho National Laboratory, Idaho State University, and University of Idaho. UW brings expertise in high-performance computing, subsurface water science, petroleum engineering, geophysics, energy and natural resource policy, economics and law, fossil energy systems, and materials science and related research. UW's School of Energy Resources has strong partnerships with the energy industry that will allow CAES members access to a broader range of research and development funding opportunities and greater impact on regional economic development.

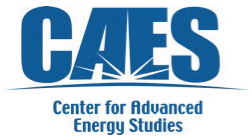
## CAES by the Numbers*

Stemming from a $2 million Idaho investment, in FY 2014 CAES derived...

- **$4.6 million** in combined University and Idaho National Laboratory infrastructure and operations funding.
- **$15.5 million** in research program funding.
- **372** graduate degrees from CAES related activities.
- **860** graduate students sponsored by CAES related projects.
- **1,383** undergraduate students supported by CAES related projects.
- Over **2,660** visitors to the CAES Computer-Assisted Virtual Environment (CAVE) 3D data immersion research environment.

*NOTE: University of Wyoming (UW) numbers are not included in these calculations because UW joined the CAES consortium at the beginning of FY 2015.



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